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Arboretum *bulletin*

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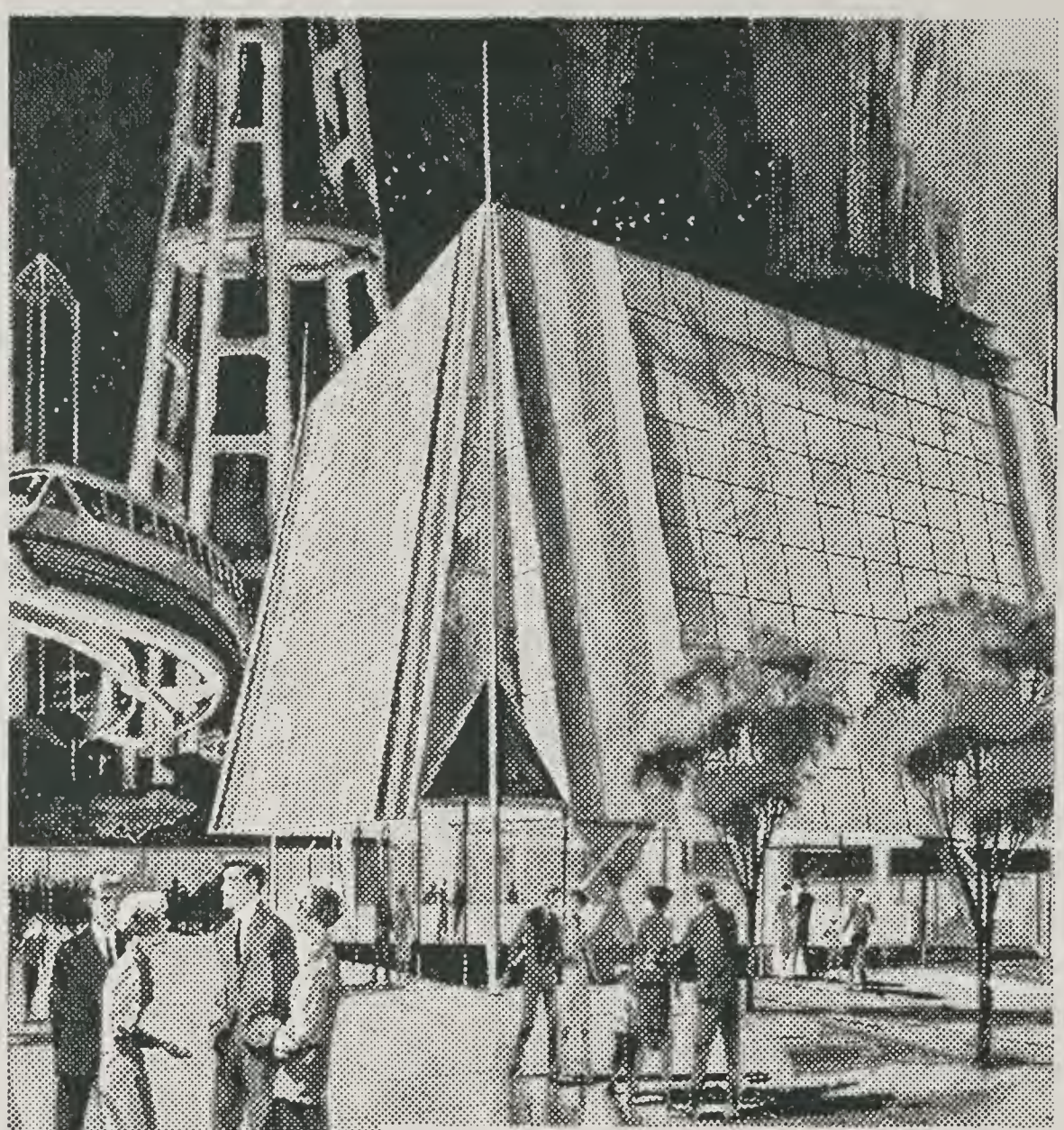

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THE UNIVERSITY OF WASHINGTON

Arboretum bulletin

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COVER PHOTO:
Seedling of *Rhododendron Loderi*
PHOTO BY: J. A. WITT

What to Look For in the Arboretum

April - May - June

BEYOND question this three-month period, April, May and June, represents the high point of the Arboretum's flowering year. Probably more than three-fourths of our showiest plants will bloom during this quarter, including the majority of the rhododendrons, cherries, crab apples, magnolias, and others that constitute our most spectacular displays.

If the weather cooperates — which it has done in the past five or six years — Azalea Way will be the main center of attraction during the last week of March and the first weeks in April. The Japanese spring cherries, *Prunus subhirtella,* in all their varied forms should be at the height of their flowering period. The two weeping forms, 'Pendula' and 'Eureka Weeping', found all along Azalea Way start the procession, followed closely by the 'Stellata' group northwest of Woodland Garden and the type form growing on the west side of Azalea Way, about opposite Winter Garden. As soon as the early Japanese spring cherries begin to fade the Yoshino cherries, *Prunus yedoensis,* pick up the tempo of spring and carry on for about two weeks. They are usually accompanied by the bright pink Sargent cherry *(P. Sargentii),* and its paler hybrid *P. Juddii,* the Judd cherry, both of which are scattered along Azalea Way with particularly good specimens at the north end opposite the Clubhouse and at the foot of Loderi Valley. Before these beauties have passed they are replaced by the first flowers of the Japanese ornamental cherries, *Prunus serrulata* varieties. The incomparable 'Shirotae' ('Mt. Fuji') is first, usually in the midweeks of April. 'Shirotae' is followed by 'Kwanzan,' 'Ukon,' 'Fugenzo' and many others both on Azalea Way and in Rhododendron Glen so that cherry blossoms can be seen well into May.

The cherries alone would make Azalea Way a place of rare beauty, but with the addition of the flowering eastern dogwoods *(Cornus florida)* and our native *Cornus Nuttallii,* as well as the many thousand azaleas, there are few areas that can compare with it for floral display. Our native dogwood is the first to flower in mid-April, soon followed by *Cornus florida* in early May. The azaleas begin earlier; at the south end of Azalea Way *R. Schlippenbachii,* the royal Azalea, often shows first color by early April and by mid-May they are all at their height, deciduous and evergreen. They will continue on until well into June when the western Azalea, *R. occidentale,* is at its best.

The *Ceanothus* or California lilacs can be expected to be at their finest from late April to mid-May, both around the office and greenhouses where the spectacular *C. impressus* 'Puget Blue' holds sway, and in the collection on the east side of Azalea Way somewhat north of Rhododendron Glen.

In the Glen, Rhododendrons and Magnolias will have been blooming in profusion since early April, first in one area then in another. Those who would like to follow the flowering here are invited to pick up the Rhododendron Glen leaflet in the office which gives the sequence of bloom in much more detail than can be covered in this short article.

Don't forget to visit Loderi Valley in May —early to mid-month—to see the *Rhododendron Loderi* clones with their numerous seedlings, and don't fail to enjoy wonderful color and texture of the new foliage on the Japanese maples, in Woodland Garden in mid-April.

J. A. W.

Arboreta and Gardens of N.W. Europe; part 5

B. O. Mulligan

FROM southwest England a relatively simple method of crossing the English Channel to France is to take the night steamer from Southampton to Le Havre, then the train next morning to Paris, where one arrives about noon.

Staying in a recommended small hotel near the Musée d'Histoire Naturelle I was able, through the kindness and courtesy of Dr. Alicia Lourteig of that world-famous institution, to glimpse something of the botanical work proceeding here, and of the vast extent of the collections in the herbarium.

But my real reason for visiting France was to see the famous National Arboretum, the Arboretum des Barres, at Nogent-sur-Vernisson, about 90 miles south of Paris, whose Director, M. Jean Pourtet, I had had the pleasure of showing round our own Arboretum during his North American tour, August-September, 1948.

Experimental plantings were begun here in 1821 by M. Philippe-André de Vilmorin, continued by him until his death in 1862, after which a part of the estate was acquired by the Forests Administration of the French government. Formation of the Arboretum began about 1866, of a School of Forestry in 1873.

A Fruticetum, or collection of shrubs, was created in 1894 by M. Maurice de Vilmorin; finally the balance of the property was handed over to the State in 1921.

As a result of this continuous history of planting the collections are most comprehensive, as may quickly be seen from scanning the two-volume illustrated catalogue published in 1944 and 1949,[1] though subject to the limitations of soil and climate, of which spring frosts, summer droughts and periodical cold winters are major handicaps to satisfactory growth of many species from cooler or more mountainous regions.

The process of reaching the Arboretum was made easy by the kindness of Dr. Roger de Vilmorin, head of the well-known Parisian seed company, whose grandfather had originally begun the plantings in the domaine des Barres, who drove Dr. Lourteig and myself down there on the morning of September 1st, unfortunately incurring a flat tire en route.

The rest of the morning and most of the afternoon—separated by a memorable lunch at the charming home of M. and Mme. Pourtet—was spent in the several different arboreta to be found in this remarkable establishment, which is primarily used for forestry purposes and includes a considerable number of forest tree plots of some age, as well as a recently established "orchard" of fifteen selected types of our native *Abies grandis,* one of the fastest growing conifers in that part of France.

To me, by far the most interesting feature was the number and variety of mature conifers to be seen, and especially those introduced near the end of the 19th and early in the 20th century by French missionaries or consuls stationed in western China, or by plant explorers such as E. H. Wilson, George Forrest and J. F. Rock. In our own arboretum here in Seattle we have vigorous young plants, especially of firs and spruces, from 2-8 ft. tall, raised during the past ten to twelve years from seeds received from Barres, the most valuable source for such material of any of the institutions with which we exchange seeds.

Of the 42 species of *Abies* in the catalogue (plus several varieties, hybrids and clonal forms) I was most interested in the North African *A. marocana,* a near relative of the Spanish fir *(A. Pinsapo),* 40 ft. high after thirty years growth; the exceptionally rare *A. nebrodensis* from Sicily, of the same age but slightly smaller and likewise coning; the western Himalayan *A. Pindrow,* bearing resinous purple cones; *A. recurvata* from W. & N.W. China, 27 ft. in height and growing vigorously; a 40 ft. tree of the Santa Lucia fir, *A. venusta,* from S. California, sometimes damaged by cold weather. Finally, two very

large old trees. perhaps 80 ft. high and 90 years old, of *A. Pardei,* originally described here by Gaussen in 1928: their origin is unknown, but they appear to be related to *A. numidica,* an Algerian species which thrives here and is remarkable for its unusually large cones (fig. 2), about 8 inches in length.

Spruces are almost as numerous, comprising 39 species. One of the most distinctive with its pale green slender leaves, glaucous beneath, is *Picea morrisonicola,* which although a native of Taiwan (Formosa) is hardy at Barres and therefore undoubtedly so in Seattle. The cones (fig. 3) are about 2 inches long. The beautiful Himalayan *P. Smithiana,* although susceptible to spring frosts in its youth, had reached 45 ft. in height after nearly sixty years growth, while *P. purpurea,* from western China, about 30 ft. tall in thirty years, was growing vigorously and producing cones. Another Chinese species, *P. montigena,* was notable for the rich orange coloring of the young branches.

Below:

M. J. Pourtet, Director, and Dr. R. de Vilmorin (on left), at Arboretum des Barres, France. *Pinus pumila* in background, planted 1930.

FIG. 1 PHOTO BY: B. O. MULLIGAN

Various other conifers must certainly be mentioned even if only very briefly. One of these is *Cedrus brevifolia,* from the mountains of Cyprus, a handsome pyramidal specimen about 50 ft. tall after half a century's growth, very rare in cultivation but unquestionably worthy of greater distribution and trial. Another was the Chinese hemlock, *Tsuga chinensis,* apparently quite successful here, since from the original trees planted in 1923 a second generation has been raised and is growing up rapidly. I am glad to say that we have a few plants of this species in Seattle.

Californian conifers generally seem very much at home in this climate. The incense cedar, *Libocedrus decurrens,* has attained 90 ft. or more, the big-cone Douglas fir, *Pseudotsuga macrocarpa,* a vigorous and healthy 50 ft., coning freely, as was the California nutmeg, *Torreya californica,* planted in 1880 and now 35 ft. tall; this has produced self-sown seedlings. From central Arizona, *Cupressus glabra* had formed a splendid specimen over 50 ft. high in forty years; one of the hardier species of the genus, like its near relative *C. arizonica.*

Near the Administration Building an area of perhaps three acres has been allotted to conifers showing variation from the normal type,—golden or grey forms, fastigiate, columnar or dwarf clones,—an excellent plan where large collections are grown. Amongst these I saw for the first time a fastigiate form of *Abies, A. Pinsapo* 'Pyramidata,' 16 ft. tall, potentially valuable for small gardens. With extremely glaucous, silvery white leaves, *A. concolor* 'Candicans,' originating in a nursery at Angers, France, is most distinct and attractive; we have nothing like it here and it should be introduced. *Cupressus glabra* 'Conica' is a selected narrow form, with the typical sage grey coloring of *C. arizonica* and this species.

So much for this remarkable collection of conifers. Amongst the deciduous trees at the Arboretum des Barres are likewise many mature and handsome specimens; for example, two lindens, *Tilia amurensis* (35 ft.), from Manchuria and Korea, which we are growing

in Seattle, and *T. mandshurica,* a small tree here about 15 ft., flowering at this late date, a most unusual and valuable character.

Maples and magnolias, oaks and hornbeams, beeches and hickories, all were seen and noted that day or the next, for I stayed overnight in Nogent and returned to Paris next afternoon by train. Perhaps one of the most unusual and remarkable trees, though a small one of 20-25 ft., was the Chinese *Platycarya strobilacea,* a relative of the hickories, though nearer to the wing-nuts *(Pterocarya)* of Japan, China and the Caucasus mountains, but the fruits, instead of being pendulous, form a short upright cone quite unique in this family *(Juglandaceae).* An evergreen oak from Japan of considerable decorative value for its lanceolate leaves glaucous beneath is *Quercus myrsinaefolia,* here attaining 30 ft., another tree well worthy of trial in the Puget Sound region.

This was certainly one of the peaks of the whole tour, fully reaching my expectations from previous reading and information.

Leaving Paris by train on Sept. 4th I travelled through Brussels to Antwerp, arriving in early afternoon, to be met by M. Georges de Belder, from Kalmthout, close to the Dutch border, where with his elder brother Robert and Mme. de Belder they maintain a well-known Arboretum on the site of the 19th century Van Geert nursery.

Here, by their hospitality I was enabled to stay for a week, to visit by car a variety of horticultural or arboricultural establishments within reach,—the Arboretum Tervuren, eight miles east of Brussels, the Botanic Garden Jean Massart at Auderghem in the same area, the private garden of J. P. van Hoey Smith in Rotterdam, most notable for the collection of oaks as well as for certain specimen conifers, and three nurseries, which must be treated separately.

At Tervuren, which is an arboretum of about 250 acres belonging to the Belgian government, first planted 1903-1904 and now containing 310 different species of trees and shrubs, one can walk for several miles along avenues of beech trees, through successive areas planted according to the geographical origin of the trees from northern temperate regions of the world.[2] North American trees are generally successful and well represented by groups of red oak, pin oak, tulip tree, *Liquidambar,* white pine, white and black spruces, black walnut, etc., for the eastern U. S.

Of western species Douglas fir, western and mountain hemlocks, *Thuja plicata,* incense cedar *(Libocedrus)* and giant Sequoia looked well and typical. The Japanese examples, which included *A. Veitchii* and *Abies homolepis,* Japanese larch, *Cryptomeria, Zelkova serrata* and *Fraxinus pubinervis* (of section *Ornus*) were less vigorous, due in some instances to being overshadowed by large neighboring beech trees.

The Arboretum at Kalmthout contains a number of unusual or interesting old trees dating back a century or so to the Van Geert ownership, especially conifers, of which a "dwarf" table-topped form of Norway spruce

Below:

Branch and cones of *Abies numidica* 'Glauca'; latter 8 inches long. Arboretum des Barres, France.

FIG. 2 PHOTO BY: B. O. MULLIGAN

(perhaps 'Clanbrassiliana'?) standing in splendid isolation on the large lawn, some 13 ft. high by 21 ft. across, was a revelation of what such plants may become with age, ample moisture and no doubt a vigorous root-stock.

Two specialties are *Hamamelis* and Japanese maples. Of the former there is a walk planted with *H. japonica,* up to 20 ft. in height, which in spring must be a charming sight. New forms and hybrids are also being raised from seeds; one of these, 'Jelena,' has received an Award of Merit from the Royal Horticultural Society in London, and is now being propagated commercially. Considerable numbers of Japanese maple seedlings are being grown, especially of var. *dissectum,* with a view to obtaining new and distinct forms.

Considering the three nurseries mentioned in the order visited we arrived first at that of P. Lombarts and Son at Zundert, near Breda, very close to the Belgian border. Here, on about 86 acres are grown more than 5000 kinds of plants, principally trees and shrubs, including fruit trees and roses, as well as a selection of herbaceous plants; 25 men are employed.

Mr. Jac Lombarts and son Pierre took us on a thorough tour of much of this closely planted land, during which we were shown a wide cross-section of the woody plants cultivated, many of which are quite rare or even unknown in this country, particularly the numerous named horticultural forms of all kinds of trees.

Examples are *Platanus acerifolia 'Merkovic,'* having purplish young shoots; *Fagus sylvatica* 'Roseo-marginata,' a European beech with pink-edged purple leaves; *Sorbus thuringiaca (S. aucuparia x S. Aria)* 'Leonard Springer,' with heavy bunches of large scarlet fruits; a series of new *Sorbus* hybrids with fruits of various hues from rose-pink to yellow; *Fraxinus excelsior* 'Hessei,' where the usually pinnate leaves are reduced to a single large one; half-a-dozen new crab apple hybrids from Kornik Arboretum in Poland; the recently introduced golden-leaved black locust, *Robinia Pseudoacacia* 'Frisia,'—and so on. It was evident that this nursery was not content only to propagate the best of the older plants but also was actively engaged in introducing promising new forms from wherever they could be obtained,—a wise policy in such a competitive business in Holland.

Below:

Coning branches of *Picea morrisonicola;* cones 2 inches long. Arboretum des Barres, France.

FIG. 3 PHOTO BY: B. O. MULLIGAN

September 10th was fully occupied in the world-famous nursery town of Boskoop, around which more than 600 nurseries are to be found. The first visited, and one of the most important so far as the wholesale production of trees and shrubs is concerned, was that of F. J. Grootendoorst & Sons, some 32 acres in extent, made up of a number of long, narrow strips of land between the canals which are so plentiful in this region and much used for transportation of plants to their various markets, as well as for incoming materials and supplies. The methods of cultivation, close planting of and in the rows, tying the young standard trees to bamboo stakes, the regular dredging of the canals to provide more soil for the steady

(Continued on Page 30)

INTRODUCTION

The Arboretum Bulletin *Editorial Board is happy to present the following three papers by members of the faculty of the College of Forestry, University of Washington, on the basic subjects of Soils and Plant Associations in Western Washington, and Plant Competition and Toleration.*

We hope they will provide better understanding of the material in which our plants live, how they are associated in the wild state and their sometimes unexpected behavior in our gardens.

Western Washington Soils In Relation to Garden Ecology

S. P. GESSEL*

THROUGHOUT the ages man has always been close to the soil. He has depended upon the soil to produce most of his food and has even used it as a means to provide shelter and a location to carry on life. In fact, soil was such a commonplace item in his existence that uses were accepted without understanding the direct functions. Ancient writings do contain references to the soil and even some consideration of its relationship to the well-being of man. The cycle of life related to the soil was even referred to in biblical writings, but a factual development of the soil as one of the important natural resources of the world has had to await the rise of modern science.

We now have a body of knowledge actually called Soil Science and a group of highly trained workers who call themselves soil scientists. In all countries of the world they have the responsibility to study all aspects of the soil and then relate this information to the needs of the rest of the people of the world who use the soil. We owe a great deal of the advancements which have made it possible to produce three or four times as much food per acre as 50 years ago to these soil scientists. The fields of mechanical and structural use of soil materials have been developed so that now the first step in any major constructional activity is a soil survey. An understanding of the soil has enabled us to use it wisely instead of losing it through destructive erosion processes. The soil scientists also developed our understanding of the relationship between plants and soils to the point that crops are now selected for each soil and soils for crops. By virtue of continued developments in fertilizer technology, soil nutrient status can now be readily altered to fit plant needs.

Before concerning ourselves with procedures in soil use, we must first learn something about the nature of the material we call soil. This is usually best done by defining the subject. However, in the case of soils I am not sure this helps as we find definitions of soil as varied and broad in scope as the imaginations of the people who have worked with the material. For some, a simple statement of "Soil is the material in which plants grow" is sufficient, but for others the definition must include the origin, position, development, and important features of the material called soil. Webster defines soil as "the upper layer of the earth which may be dug, plowed, etc.; specifically, the loose surface material of the earth in which plants grow." I personally feel that the best definition is one which describes the components of the soil and will therefore do this in the next section.

Soil is a complex mixture of living and dead organisms, mineral material, water, and

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gases. A unique feature is that the mixture is not the same through a vertical section. In other words, the surface layer is different from a layer six inches or a foot below the surface. A concise way of describing this is that the soil has a physical character which distinguishes it from other soils. Because the soil is inseparable from living things, we call this aptly a profile. The separate layers are called horizons. Plants also recognize this variation by rooting in specific layers more than others. Contrary to popular opinion, the surface layer may not always be the best. Each of these horizons has a characteristic combination of living and dead organic materials, mineral particles, water, and gases. As we progress deeper in a soil, the properties are more closely related to the rocks and minerals underlying the soil. The relatively unchanged rocks and minerals are called the soil parent material. However, the relationship between soil and parent material is not always direct and simple.

In order to understand the soil more clearly we need to consider factors of the environment which cause it to be as it is. We call these the soil forming factors and ascribe to them the ability to determine the properties of a given soil. Therefore, if we know what these factors are in a given area, then we should have a good idea of the soil. Actually, these same factors operate much the same way as regards plants, so an understanding of the factors is doubly important.

The soil forming factors are:

1. Age of soil
2. Parent material of soil
3. Topography of the soil location
4. Climate of the soil location
5. Organisms living in and on the soil

Perhaps a brief word of explanation is essential for each factor, so this will be attempted.

Age of Soil

As soil characteristics are dependent upon the length of time, and more specifically the rate at which various chemical and biological reactions take place in the soil, it is quite apparent that age has an important effect on properties. The effect is more apparent when soils are young than when old as this is when properties are changing more rapidly. Young soils are usually found in association with recent changes in nature, such as sand dunes, flood deposits, and retreat of glaciers, while old soils are related to stable landscapes. The constructional activity of man, resulting in removal of top soil, creates very young soils, with entirely different properties than in the old.

We cannot always say that young soils are more productive than old soils, or vice-versa, because productivity is related to many factors. However, we do know that many of the most productive soils of the world, as in the rich river valleys, are the young soils. On the other hand, even an older scalped hillside in Seattle would represent a rather unproductive young soil.

Parent Material

Parent material is the basic material from which the soil makes up its major bulk. In some cases it is quite easy to see the relationship between soil and parent material, while in others it is more difficult. Usually parent material is inorganic in origin but it may be organic as in peat soils. In the realm of inorganic material, it should be quite obvious that the nature of the rocks and minerals making up the bulk of the soil will have an important effect on soil properties. The deficiency or over-supply of certain essential elements is related to the type of parent materials. Parent materials also differ very markedly in the rate at which they weather and thus break up into soil particles, some doing this slowly and some rapidly. Some parent materials are notorious for the poor soils they form. In this category are serpentines and high quartz content rocks. Others are noted for the productive soils developing on them. The soils of the Blue Grass region of Kentucky would fall in this category, as would the rich river alluvial soils.

Topography

The topographic situation on which soils occur also determines their development and properties. This can be commonly observed

by looking at soils on ridges, slopes, and depressions. The deep fertile soils generally occur at the bottom of the slopes with shallow soils on the ridges. Topographic situations affect soil drainage and moisture regime, which in turn relates to many soil properties and soil-plant relationships.

Climate

The common expressions of climate, temperature and precipitation determine many properties of soils by controlling many of the biological and chemical processes taking place in the soil. In the extremes this effect is easy to recognize by driving from sea level in western Washington to the passes of the Cascades and then on to dry eastern Washington. If you examined soils on such a drive, you would find that they change as dramatically as the climate. Colder temperatures reduce the rate of action of both chemical and biological processes, and therefore slow down soil formation. High precipitation causes large quantities of water to pass downward through the soil. This water dissolves and removes nutrients from the soil. Dry conditions result in evaporation and reduce downward water movement, or even cause upward water movement and alkaline soils. Many other important soil properties have known relationships to climate, including acidity and nitrogen accumulation.

Organisms

The type of plant and animal life in and upon the soil is an important factor in determining the properties of each soil. The more important constituents of the plant and animal population are micro-organisms and lower animals. Distinct contrasts provide the best means of examining the effects of organisms. Whether a soil is covered with grass or with forest trees within a given area determines many of the properties of the soil. As a more concrete example, soils formed under our common red alder are different from those under Douglas fir.

Only by understanding the part that each of these soil-forming factors play in causing a particular soil to be as it is can intelligent use and management of a soil be contemplated.

Soil-Forming Processes

An additional background to understanding soils must be provided from a consideration of some simple soil-forming processes. Some of these relate specifically to the movement of water in soils. Depending upon the supply, the water can move either up or down. The presence of water means solution of various elements in the soil and these also move up or down. In the case of downward movement, we have leaching, and, if the soil is well drained, total removal of both water and elements from the soil. There are many forces in the soil tending to counteract this total loss but certainly under a given set of conditions the soil can become impoverished as a result. This does not mean that all humid area soils are poor. Water can also move upward and evaporate from the surface. In this case, dissolved materials are left behind as salt deposits and in the extreme give rise to alkali soils.

Processes of building up or accumulation are also important in soil development. The accumulation can apply to any element or complex of materials, but a simple case will best demonstrate that a young soil normally begins life with very little organic matter or nitrogen. These components both accumulate as a result of living processes taking place on and in the soil. As a result, organic matter accumulation can take place throughout the life of the soil, rapidly at first and then more slowly as the soil reaches equilibrium.

A consideration of both of these processes immediately tells us that the soil is a dynamic system, a fact that we should always keep firmly in mind when working with the soil.

The Soils of Western Washington

The foregoing should set the stage for a look at soils of western Washington. We have a humid climate, but with great differences in total precipitation within relatively short distances, and also distinct wet and dry seasons. This climatic pattern determines that western Washington soils are all acid, generally well leached, but also with a dense vegetative cover under natural conditions which conserves and stores elements.

Our geologic history has left a distinct imprint upon our soils. Broadly speaking, the lowland areas are either glaciated or non-glaciated. The glacial effect is from the Chehalis river northward and has resulted in large areas of glacial outwash and fill. Some of these areas are very gravelly, as the Fort Lewis plains or areas of Kitsap, Island, and Mason counties. These gravels give rise to the poorer soils of western Washington. The non-glaciated area is generally either old sediments or basalt materials. These have both weathered deeply and form deep—but leached—soils. For forest production they are among the best in the world but need wise management when used for agriculture.

A post-glacial influence in both of these areas is the flood plains and valleys of the major river systems from both the Cascades and Olympics. Flood plains represent the accumulation of the better materials eroded from the uplands and therefore these are the most fertile soils in western Washington. The rich farming areas of the Skagit, Puyallup, Duwamish, and Snohomish rivers attest to this. Higher and older terraces of the river systems may not be as fertile because they are made up of coarser and older materials.

Soils of the uplands and more mountainous regions have a greater diversification of origins and properties and have been relatively little studied. Some result from glacial deposits and others represent formations from hard rock. A noteworthy feature that has been largely ignored is that large acreages of our upland soils are from pumice deposits from major periods of volcanic activity. Sometimes this ash deposit is only a few inches thick and in other places many feet, but in either case can have a profound effect on soils. A few areas of highly basic rocks, such as the olivines of the Twin Sisters area, result in very different, and, usually, poor soils.

Special Soil Problems in Western Washington

The association of soil-forming factors found in western Washington has given rise to the processes resulting in soils as we find them today. Soils are distinguished and studied by virtue of the fact that they have a certain set of physical, chemical and biological properties. A knowledge and evaluation of these properties enables us to know how to use and manage a soil for a given objective. It is the purpose of this section to relate some of the association of properties of western Washington soils and how these can affect and direct management objectives. In all of this we should keep in mind that the soil has to supply water and elements to the plant and be a rooting medium.

Because our area is well supplied with total rainfall but with distinct dry seasons, soil properties which retard soil moisture movement can have drastic effects on plant growth. The presence of the characteristic glacial till hardpan under so many of our soils can be a favorable or unfavorable factor depending upon depth of the hardpan. Shallow soils in depressions means accumulation of excessive water during the wet season, thereby eliminating many plants. On the other hand, the coarse texture and excessive drainage of deep gravelly outwash soils mean a water deficiency during the dry part of the year and the need for careful irrigation practices.

The natural structure of our soils as found under good forest vegetation means ideal distribution between air, water and solid materials in the soil. When this same soil, and particularly with a fine texture, is placed under cultivation, this structure may be rapidly destroyed. The soil then becomes dense and compact and no longer an ideal medium for the growth of plants. The destruction of the soil-inhabiting organisms could account for the change in structure.

By virtue of the good supply of water moving through western Washington soils, they have been leached of all readily soluble salts and are acid in reaction. This is really not anything to worry about and immediately try to change, as a good share of the really productive soils of the earth are acid in reaction. The degree of acidity can mean that certain elements are in shorter supply than desirable. Most plants are not as sensitive to soil reaction as is commonly supposed, but they are sensitive to available elemental supply, and this can be affected by soil

reaction. For example, in most of our acid soils phosphorus is in adequate total supply for plants but most of it is not available in sufficient quantities for the introduced plants we commonly grow. We therefore have the anomaly of a plant suffering severe phosphorus lack while growing in a medium containing a large total supply. We can correct this deficiency by adding phosphorus to the soil, but even this is not a sure cure because much of the added phosphorus can itself be fixed in an unavailable form in the soil. The obvious answer is to place the phosphorus in a position more easily reached by plant roots.

Organic matter and nitrogen relations of our soils are particularly important because of rapid changes of these properties and the role of each in plant nutrition and other soil properties. Organic matter undergoes a natural cycle of addition and decomposition in soils. Decomposition results in the release of all elements contained in the material and therefore availability for re-use by plants and other organisms.

The normal functioning of this cycle is necessary for the well-being of soils. If it is stopped or slowed down by lack of additions of organic matter or by changes in decomposition rate, then adverse effects may be expected to develop. Organic matter not only provides a reserve of elements, particularly nitrogen, but can improve soil physical conditions. It is also the food supply for the host of organisms living in the soil and carrying on processes essential to the well-being of soils and plants. Organic matter is an easily destroyed component of the soil, and is usu-

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Plant Associations of Western Washington

David R. M. Scott*

THE FLORA of the Pacific Northwest, including that of western Washington, has been the object of numerous treatises in scientific literature. These have included broad descriptions of zonal vegetation, definitive checklists of species, partial descriptions of plant associations, specific details of cover types in particular locations, theories regarding successional relationships, and surveys of timber and grazing resources. A partial list of the more interesting publications is appended for those interested in investigating these topics in detail.

Certainly it would be most difficult to describe the almost innumerable combinations of plant species and plant community structures in western Washington; indeed, it is unlikely that any one person has sufficient knowledge to accomplish such a task, and, if it were attempted, the resultant tome would be not only gigantic in size but truly monumental in qualities of boring those who attempted to comprehend it.

It is apparent to anyone who has observed natural vegetation with any degree of care that exact community structure and species composition may well be controlled by the fortuitous timing of very local events; in other words, chance plays a large part in determining the details of any plant association. Different species, indeed entire local cover types, may fill essentially similar ecological roles. This does not mean that each species or combination of species does not have any characteristic qualities which give it very definite competitive advantages relative to other species in particular environmental circumstances. Rather, there is the implication of latitude in the manner in which environment can satisfy specific plant requirements.

Therefore, while it may be impossible to outline every conceivable variation in a plant association in a particular region, there is usually sufficient fidelity to broad patterns of behavior, association, and change to allow for reasonable description.

In the following description the common cover types are grouped into plant associations of two types. The first is composed of

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those plant communities that originate following some disturbance that greatly alters or even wipes out existing vegetation. The dominating plant species are those which are able to invade, establish themselves and successfully survive in more or less open areas. These make up the so-called pioneer or subclimax cover types. The second type of association is comprised of cover types that are established beneath existing vegetation, and can reproduce in their own shade provided no severe disturbance intervenes. Of course, the plant species dominating such climax cover types have different demands and abilities than do the pioneering species. These differences in the ecological behavior patterns of various species are excellent guides for many cultural practices.

Convenient bases for description and grouping are the life zones of Merriam (1898). The table below gives the cover types that have been recognized by various authorities, grouped in subclimax and climax plant associations for each life zone in western Washington. The cover types in each association are arranged in approximate order from those that are found on wet sites to those found on dry, sterile soils.

TABLE I

Life Zones, Plant Associations, and Cover Types of Western Washington

Life Zone	*Subclimax Plant Association*	*Climax Plant Association*
Humid Transition	**Douglas-fir—red alder**	**Western hemlock-western red cedar**
	Covertypes	Covertypes
	Black cottonwood-willow	Western red cedar
	Red alder	Western red cedar-western hemlock
	Douglas-fir-western hemlock	Sitka spruce-western hemlock
	Pacific Douglas-fir	Grand fir
	Lodgepole pine	Western hemlock
	Western white pine	Pacific silver fir-hemlock
	Oregon white oak	**Hemlock—cedar—spruce**
	Oak—madrone	Covertypes
Humid Transition	**Sitka spruce—red alder**	Similar to above
(Coastal subzone)	Covertypes	**Pacific silver fir—hemlock**
	Similar to above except no oak or oak-madrone	Covertypes
		Western hemlock—western red cedar
Canadian	**Douglas-fir—noble fir-white pine**	Grand fir
		Pacific silver fir-hemlock
	Covertypes	Mountain hemlock—subalpine fir
	Similar except no oak or oak-madrone and add noble fir	Engelmann spruce—subalpine fir
		Alaska cedar
Hudsonian	**Whitebark pine-alpine larch**	**Subalpine fir-mountain hemlock**
	Covertypes	Covertypes
	Whitebark pine	Mountain hemlock-subalpine fir
	Lodgepole pine	Engelmann spruce-subalpine fir
	Noble fir	Red fir
	Ponderosa pine	Alaska cedar
Arctic—Alpine	**Saxifrage—heather**	**Saxifrage—heather**

The humid transition zone extends from sea level up to 1500 feet in the Olympics and to about 3000 feet in the Cascades. There is a narrow strip along the Pacific Coast that, due to a much wetter climate, deserves separate consideration as a subzone.

Douglas-fir stands are considered the hallmark of western Washington. This single species dominated vast areas when the region was first seen by the white man. Red alder, however, increased in subclimax communities when natural disturbance was in considerable measure replaced by man-caused disturbance in which Douglas-fir was often removed by logging. Subordinate vegetation includes swordfern, salal, Oregon grape, vine maple and several species of two genera, *Vaccinium* and *Rubus*. Salal is most abundant on poor sites and swordfern on good sites. Cottonwood appears to develop to best advantage on newly-formed alluvium, where the seedlings have little competition and where the water table is close to the soil surface. Western white pine and lodgepole pine are unique in that they appear well adapted to both very swampy and very dry sites. Oak, ma-

drone and ponderosa pine are important members of the association on coarse-textured dry soils. Other species that may occur in the Douglas-fir-red alder association are big leaf maple, cascara and Pacific dogwood, and, of course, the species in the western hemlock-western red cedar association which usually develop as an understory.

If there had been less natural disturbance, the forests of western Washington and Oregon might well have been called the hemlock-cedar region instead of the Douglas-fir region.

In the hemlock-cedar association, a typical stand is an uneven-aged mixture of hemlock and red cedar, usually with the first species most abundant. Subordinate vegetation is similar to that in the Douglas-fir-red alder association but is often sparser, due to the heavier canopies of the tolerant tree species. Red alder is more prominent on wet sites and Pacific silver fir increases with altitude. Grand fir is important on small areas of good alluvial soil. On the poorer sites the long-lived species of the Douglas-fir-red alder association are increasingly present in the climax association.

The Sitka spruce-red alder association of the coastal subzone is very similar to the Douglas-fir-red alder association, except that Sitka spruce replaces Douglas-fir in importance and subordinate vegetation is somewhat more lush and varied. Species such as Pacific red alder, devil's club and various mosses are common. The covertypes adapted to drier sites of the Humid Transition zone proper are not found along the coast. Sitka spruce is also a much more common and important species in the climax association in the coastal subzone than is Douglas-fir in the hemlock-cedar association farther inland. This is due to the greater tolerance of the spruce and its consequent better regeneration in undisturbed forest stands.

The Canadian zone, the equivalent of the transcontinental boreal forest, starts at 1500 feet above sea level in the Olympics but is not fully developed until about 3000 feet in the Cascades. The subclimax Douglas fir-noble fir-white pine association is, in one sense, a mixing of two zonal floras. While many of the species are those found in the subclimax association of the Humid Transition zone, there is a shift in relative importance as well as additional species. Oak and madrone are not present, white pine is more abundant and important, and in the Cascades as altitude increases, noble fir gradually replaces Douglas fir. Strangely enough, noble fir does not occur in the Olympics. Western larch is occasionally found in this association and lodgepole pine occurs on certain soils of pumice origin. Subordinate vegetation includes *Cornus canadensis, Chimaphila Menziesii, Gaultheria ovatifolia* and *Rhododendron albiflorum,* as well as several species of *Vaccinium* and *Rubus.*

The climax association of the Canadian zone is distinguished from that of the Humid Transition zone by the diminished importance of western red cedar and the increased dominance of Pacific silver fir *(Abies amabilis).* In the upper part of the Canadian zone this latter species reproduces much more than western hemlock and is the major tree species in the association. Mountain hemlock also replaces western hemlock at high elevations. Subordinate species are similar to those listed for the subclimax association.

There is limited information about the ecological characteristics of the plant species in the Hudsonian zone. The plant associations here have a structure typified by subalpine meadows in which are found groups of trees. At upper levels (about 5000 feet in the Olympics and 6500 in the Cascades) these trees are quite stunted and may even assume prostrate forms. Tree line occurs at higher elevations on ridges where wind prevents maximum snow accumulation. There is no clearcut successional trend, but the species in the white-bark pine—alpine larch association are considered more tolerant than those in the subalpine fir—mountain hemlock association. Whitebark pine *(Pinus albicaulis)* is usually the tree species that attains highest elevations in the southern Cascades in Washington, although larch *(Larix Lyallii)* may occur in mixture with it and in northern Washington larch is often the tree line species.

In more protected and lower elevations in

the Hudsonian zone, the mountain hemlock-subalpine fir mixture is considered the typical tree covertype. Other species of prominence include *Spiraea densiflora, Vaccinium deliciosium, Mimulus Lewisii* and certain heathers (*Phyllodoce* and *Cassiope* species).

The Arctic-alpine zone extends from tree line to 7500 feet, above which there is little vegetation except a few lichens and mosses. In the Olympics the three most important families are the *Compositae,* the *Gramineae* and the *Cyperaceae*. The exact species composition varies with soil and micro-climate and the association name saxifrage-heather is rather arbitrary. The vegetation shows considerable ability to recover original composition and structure after disturbance. On Mount Baker characteristic species aside from those indicated in the association designation are: *Erigonum pyrolaefolium, Silene acaulis, Lupinus Lyallii* and *Castilleja angustifolia.* *(Bibliography on Page 26)*

Comments on Plant Competition and Toleration

ROBERT K. CAMPBELL*

VERY OFTEN, as a gardener introduces a new plant into his yard, he must feel like a general sending green troops to meet hardened veterans. Introduced plants are quite analogous to unseasoned soldiers. This is particularly true when they are to be part of an informal garden. In the more "natural" gardens ornamentals often compete primarily with indigenous vegetation.

Members of the native flora are the result of generations of selection for fitness to local environmental conditions. As a consequence they are almost perfectly adapted to live in the range of climates characteristic to the locality. Also, since plants live together, they form part of each other's environment. Hence certain groups of plants are adapted to live together, each plant occupying a particular biological niche within which it obtains materials necessary for its existence. These groups are called plant communities by the ecologist.

In a sense, the horticulturist, when developing an informal garden, attempts to establish a new plant community more ornamental than the native community. To do so he selects plants adapted to biological niches present in his yard, or creates special conditions of soil, shade, moisture, etc., to provide niches for desirable plants. The new community will probably contain some elements of the local flora plus decorative strangers. The more successful the gardener is in selecting plants to fit available niches, the easier his future garden chores will be. A plant growing in its niche is a much more efficient competitor against weeds. It is vigorous, and vigorous plants require less protection from disease and insects.

If a plant can successfully withstand invasions by other plants over a period of years, it is suited to the environment. In most cases we do not know what permits plants to be excellent competitors under certain conditions while in other conditions they fail. We do know that a good competitor can survive under a great range of environments. These plants have what may be called a wide "reaction range." The notorious international weeds such as the common dandelion are apparently vigorous competitors in a very wide range of environments.

Other plant species with little competitive ability find biological niches available to them only because they also have wide reaction ranges. Competition with other plants prevents their establishment in most places. Consequently, they are often restricted to very special habitats. They are able to survive only because their extra tolerance for environmental conditions permits them to grow in areas where they will not be smothered by other plants.

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An English buttercup, for example, is restricted in nature to very unfavorable shallow soils over limestone rock. A high concentration of calcium makes the soil very basic. This condition is not tolerated by other indigenous species. The buttercup was once called a "calciphile," that is, a calcium lover, because it was found growing only in these extremely basic soils. But experiments demonstrated that it flourished in soils far more acid if grown under cultivation where competitors were removed. Obviously this species loves calcium only because it cannot cope with the local flora elsewhere. Further, to provide an example at the opposite extreme of conditions for plant growth, Sorrel *(Rumex acetosa)* naturally grows on very acid soils, but under cultivation it prefers limed soils.

Plants also vary in competitive ability when grown under different soil moisture conditions. Almost all forest tree species are known to grow best in deep sandy loam soils that are well drained. Yet many species are confined to areas such as bogs or ridgetops where unfavorable moisture conditions obtain. The lodgepole pine *(Pinus contorta)* of the Kitsap peninsula in western Washington is a notable example. In this area it is found chiefly growing in soils where hardpan occurs a few inches below the soil surface. This causes a soil environment that is extremely dry in summer and just as extremely wet in winter. Both conditions are very unfavorable for lodgepole's faster growing competitors—more so than for lodgepole itself. Lodgepole pine is therefore restricted to such poor areas because it can compete only on these sites, even though it also prefers rich, well-drained soils.

Salt-tolerant plants have a competitive advantage particularly in gardens near salt-water beaches or in arid regions where salt often accumulates in soils. Almost all flowers and ornamental plants are sensitive to salt. Moderately tolerant ornamental plants include the genera *Bougainvillea, Hibiscus,* Oleander, and *Sansevieria. Azalea, Camellia, Gardenia* and *Magnolia* are all very poorly salt tolerant. Relatively salt-tolerant floral plants include *Chrysanthemum, Matthiola incana, Clematis orientalis* and *Dianthus* (carnation). *Primula, Hydrangea hortensis,* Poinsettia, asters, gladiola and gardenias are salt-sensitive floral plant groups. Among those that are very salt-sensitive are the hornbeam *(Carpinus Betulus),* European Beech *(Fagus sylvatica),* sycamore maple *(Acer Pseudoplatanus)* speckled alder *(Alnus incana),* Italian poplar *(Populus nigra* var. *italica), Betula dahurica, Larix* and *Juglans.* Most coniferous species are also apparently quite sensitive when drainage is poor. Salt-resistant tree species include the white poplar *(Populus alba),* gray poplar *(P. canescens),* Black locust *(Robinia Pseudoacacia),* English elm *(Ulmus procera),* English oak *(Quercus Robur), Tamarix hispida* and Russian olive *(Elaeagnus angustifolia).*

In the discussion above, we have been concerned with what might be termed the "passive" competitive advantages held by plant species with reaction ranges wide enough to allow them to compete in normally unfavorable environments. It is passive competition because the plants do not actively produce favorable environments. In this sense, most plant species are blessed only with passive competitive advantages. It is part of the horticulturist's art to determine these advantages for every species he wishes to put into his garden. If he does not, he will spend far more time on routine cleaning tasks than is necessary. Obviously, this fact has been recognized by the gardener for centuries. Otherwise, why would he plant shade-loving plants in the shade or water-loving plants in wet spots?

"Active" competition between plants is a far more recent discovery. Some plants are now known to secrete substances that inhibit the growth of other plants. Fungi and bacteria produce inhibitors of varying degrees of potency and specificity. We use these in medicine under the well-known trade names of Penicillin, Streptomycin and so on.

Many of the higher plants produce similar substances. A recent tabulation of known

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Garden Fragrance

MARGARET MULLIGAN*

OVER three thousand years ago the Egyptians were famed for their scented gardens. Many of the ancient sculptors and tomb painters reveal to us some of their splendor. To them the sweet-scented blue water lily, *Nymphaea stellata,* was a sacred emblem. The skill of the Egyptian perfume makers is well known. In the tomb of a high priest buried 3000 B. C. an unknown substance was found, so sweetly scented that after a period of 4700 years it seemed as if a bouquet of sweet smelling flowers had just been placed there. One of the most valued articles of commerce at that time was frankincense *(Boswellia olibanum),* a brittle resin used in religious ceremonies.

There are many references in the Bible to scented gardens. From the "Song of Songs" we know that Solomon's gardens were full of aromatic fragrance of shrubs and flowers, and from the Canticles we have a quotation, "Awake, O North wind and come thou South; blow upon my garden that the spices thereof may flow out." The art of distilling was unknown in biblical times but Job refers to a method of boiling vegetable substances in fat and that the Hebrew women wore "sweet balls" suspended from neck or girdle.

Rose water was the first perfume to be obtained by the Persians in 810 A.D., who later in 1612 A.D. accidently produced Attar of Roses from the Damask rose, *Rosa damascena.* In the early 13th century the French perfume makers were of sufficient importance in trade to be granted a charter, and in Chaucer's day it was possible to buy perfume only through the mercers in France. In medieval times roses, lilacs, gilliflowers (clove pinks), wallflowers, violets and iris were grown and a large number of aromatic herbs was used in medicine, cosmetics and cooking. However, it was not until the Tudor period that the scented garden really came into its own. This was an insanitary age so there was a great value in fragrance. Earth floors were strewn with rushes and sweet-scented herbs, rosemary, lavender, germander and pennyroyal. The only floral perfume known was rosewater, so the stillroom books were full of fragrant recipes for "honey of violets," "lily-of-the-valley spirits" and "lavender water." Some scented their bathing water with rose petals, lemon peel or orange flowers according to season. Mint, thmye, sage and the coarser scented leaves were used in soap and in a certain way as a disinfectant. In the Tudor period also the first potpourri was made as a recipe for "melancholy or to cause sleep." Gerard in his Herbal (1597) wrote "if odours may work satisfaction, they are so sovreign in plants and so comfortable that no confection of the apothecaries can equal their excellent virtue."

Scent is something invisible but strongly felt and has always excited the interest of man. The sense of smell does not rank as highly as the other two senses, but is more emotional and stirs the mind more deeply than seeing or hearing. It is not often realized that the pleasure value of eating and of tasting is an olfactory sensation. Taste can only appreciate the qualities of bitter, sweet or salt if one still has the sense of smell. A severe cold or a held nose will lessen flavor values; there is as much smelling through the palate as through the nose. We can detect a trace of garlic through taste rather than through smell in a salad.

The apparatus of the sense of smell is located in two small areas in the upper part of the nose containing cells from which hairs project into the nose. To obtain maximum smell take a big sniff, which brings the scented air to the olfactory area which lies to the side of the main stream of entering air. The scent of any substance is recognizably the same wherever we come across it. The smell of roast beef is delicious in the kitchen but if the same odor is found in the

*This paper was first read by Mrs. Mulligan to the members of Unit No. 1 in October, 1961.

crushed leaf of an iris it is called fetid, *Iris foetidissima.*

The odor of some substances changes with dilutions. The chemical compound indol, which when strong smells like a sewer, in dilute quantities has the fragrance of a narcissus. Scents delight some and are disturbing to others;—"too sweet and troubling and molesting the head in a strange manner" (Gerard). The personal associations that are bound up with scents are vivid and often recall some past experiences. The scent of conifers takes me back to my childhood when we used to camp under the cedars on Mt. Lebanon, but the strong scent of a cigar reminds me of being on board ship. The sense of smell is more fully appreciated by civilized than primitive people, and offers us an experience that is mostly enjoyable.

The scent of flowers and leaves is due to the presence in the plant tissue of certain mixtures of chemical substances, the essential oils which are the waste product of the plant's economy. There is an infinite variety of mixtures which equal innumerable odors in the plant kingdom, and the quality of the odor is bound up with the concentration of the essential oils. These are divided up into alcohols, esters, acids, terpenes, and nitrogen compounds. The essential oil is contained in the petals, sepals and bracts or calyces, and not in the nectaries, anthers or stamens. Many powerfully scented flowers have waxy petals, as in magnolias, and scent also gains strength in the doubling of petals, as in roses and the double flowered stocks. The essential oils are divided into six main groups and many smaller ones.

The Aminoid group contains most of the spring flowering plants. The fragrance is not too pleasant, having a stale somewhat fishy smell. The flowers in this group are hawthorn, spiraea, pear, cotoneaster and members of the *Umbelliferae.* The nectar is easily obtainable, so these flowers are fertilized by flies.

The Heavy or Indol group have extremely sweet smelling flowers and some which are slightly overpowering, such as philadelphus, jasmine, lilac and honeysuckle, as well as most of the flowers with waxy petals. Indol in greater amounts is found in animal putrefaction. The fragrance in some flowers is much stronger in the evening. Nectar is often concealed at the base of a long narrow tube and is accessible only to moths and butterflies; most of the night-blooming flowers are in this group.

The Aromatic group is spicy, lovely and cheerful and is also fertilized by butterflies and moths. This includes the Dianthus, clove pink, primroses, tobacco plant and night-scented stock. Clove scent is found in *Viburnum Carlesii,* double stocks and certain roses. A faint suggestion of aniseed in primroses and in *Primula* flowers generally. Vanilla scent is fairly common, as in *Azara microphylla* and heliotrope. The flowers of the Aromatic group are less likely to become "heady" when strong and in some cases produce exhilaration of the spirit.

The Violet group is a very small one; included in it are the sweet violet, *Viola odorata,* acacia, mignonette, *Iris reticulata* and *I. verna* in a warm atmosphere. The natural scent of the human body is related to violet, orris root and cedar wood. It is to *Viola odorata* that the old herbalists attributed the "gift of sleep." We are all familiar with the curious effect of smelling violets, the perfume of which after a while appears to have disappeared, but the violet of course still retains its fragrance; it is our sense of smell that has been exhausted. The dominant feature of their scent is ionine which has a tiring, soporific effect on the sense of smell. This group is fertilized by insects.

Rose group. The essential oil in this group is generol, a complex substance of oil of lemon, oil of bay leaves and oil of orange. Only the fragrant roses come into this group, with two species of peony, oregon grape, *Mahonia Aquifolium,* and many leaves and roots. The scent is never heavy, slightly aromatic and fruity. Most modern roses have perfect flower formation but little or no fragrance. Roses produce no nectar and are chiefly visited by small insects and beetles in search of pollen.

Citrol is the active ingredient of the Lemon

group and is contained in the citrus fruit, in some magnolias, waterlilies and in evening primrose, *Oenothera,* but is mostly found in the leaves of plants. Fruity scents are in freesias, some philadelphus, the Banksian rose and sweet briar. In *Calycanthus floridus,* the allspice, the newly opened buds smell of pineapple and the older flowers of grapefruit; the maroon flowers look like a nearly black, miniature magnolia; the leaves are slightly aromatic and the broken twigs also.

The Animal group contains most of the currants, which have a catlike smell outdoors but a strong aromatic fragrance when brought inside. There are many flower scents that are not easy to place in any group.

In hot, dry regions plants are rich in scented leaves but few have scented flowers. Most of the latter appear in the early months of the year and so give valuable fragrant flowers in the early spring; the small species of *Narcissus, Crocus* and *Muscari* are out at this time.

It is rare to find a plant that is entirely odorless in all its vegetative parts. Roots, stems, and leaves have characteristic smells, sometimes offensive but often rivaling floral perfumes in their sweetness. Some leaves have distinctive odors when dried; for example, vanilla leaf, *Achlys triphylla.* Scents in leaves cover a wide range difficult to classify, flowerlike and unflowerlike, the latter being divided into the Turpentine, Camphoraceous and Mint groups. The Turpentine group includes the conifers; Pinene, an aromatic substance, is uncommon in other plants but occasionally found in the moss rose. The Camphoraceous group is a large one and contains *Artemisia,* chamomile, *Nepeta, Santolina,* fennel, marjoram, rosemary and the thymes. The Mint group is a comparatively small one, the essential oil being menthol, a substance which induces a sensation of cold when inhaled, found in all mints, eucalyptus, and in some pelargoniums *(P. tomentosum).*

The flower-like leaf scents are numerous, few exactly similar to floral perfumes but possessing qualities described as sweet. The rose-leaf geraniums have a pronounced rose scent and their dried leaves are useful for potpourri. Lemon scents are fairly common in leaves but masked by other perfumes;—lemon verbena, lemon thyme, mint, and bergamot. Some have a fresh spicy fragrance as in the Aromatic group. Bog Myrtle and *Laurus nobilis,* the bay, contain a fragrant gum resin. *Gaultheria procumbens* contains oil of wintergreen in its foliage. A violet quality is in orris root which is the underground rhizome of *Iris florentina;* however, this needs hot sun to bring out its fragrance, which appears after the rhizomes have dried for several months and continues to increase for two to three years. Young shoots of palm are said to smell of violets.

Plants use their essential oil against insects and animals. Thorny plants rarely have odors, and most plants that grow in dry places have scent in their leaves, as bay, sage, thyme, cistus and rosemary. Oranges are only faintly scented until the seeds ripen and then the essential oil is distributed. This has a hot burning taste and so oranges and other citrus fruits are usually free from insects.

Cold air is not an aid to fragrance in flowers and so scent is more effective in warm and moist atmospheres; hence the large number of scented species amongst the plants of the woodlands and valleys. The lack of light often gives scent the advantage over color as a guide to insects and many flowers of the woodland show their likeness to night-blooming varieties in their scent and pale colors, Lily-of-the-valley and *Epigaea repens* being examples.

Odor is the prime attraction factor rather than color, for its success lies in the ability to work from a distance. The olfactory perceptions of insects are very keen: fragrance is carried in air currents and picked up by them and they are sensitive to some odors of which we are not aware. The sense of smell is not essential to us, but flower scents are necessary to plants for their perpetuation, through pollination, in most cases. From a human point of view the scent of a plant is a large part of its beauty; in the plant it plays an important part in its adaptation to life. The most specialized function of scent

is to attract and not repel. It reaches its highest development in flowers visited by nectar-feeding insects which fertilize them. The color, form and scent attract insects for this purpose and the flowers do not occur except in association with these insects. The earth had no flowers until the bees and butterflies appeared.

As the scent of the flower is determined by the insect which visits it, the relation between flower and insect deserves consideration. The carrion cactus looks and smells like carrion; it is visited by flies and bluebottles who seek it out from a long distance and lay their eggs on it. As previously mentioned, another large group adapted to attract flies is the hawthorns, *Sorbus* and all *Umbelliferae* which have stale-scented flowers. Scent is not the main attraction for bees but serves partly as a guide and a distinguishing mark to recognize the flower for their "flower-faithfulness" in visiting one species of plant only, a habit which is of great value for effective fertilization. A bee visiting a flower well provided with nectar will return to the hive and perform a kind of dance to attract the attention of the other bees who immediately gather around and palpate her with their antennae; these then leave the hive and fly to the species she has just visited. If the bee has been fed with nectar flavored with peppermint, the others will fly off and visit any flower which has a similar scent in the vicinity of the hive.

The sweetest and most highly developed scents are found in flowers which are specialized for fertilization by moths and butterflies. Moths and butterflies are themselves sweetly scented and there seems to be a connection between them and the flowers they visit. The scent is limited to the male sex only and plays a part in their courtship. They chase their mates from flower to flower or bask in the sunshine together on a scented blossom. The hawk moth will fly directly to a scented flower in the dusk with the precision of a bee. This production of scent is not limited to butterflies alone but is found in several species of insects, beetles and mammals.

The scent of flowers is related to color in so far that both have the same function but the link between them is not close. The percentage of scented species is highest in white flowers, red flowers come next, followed by yellow and purple, while very few of the blue flowers are scented. Red flowers lose their color in a faint light to our human eye and are among the first to close; they are rarely visited by night flying moths. Pure scarlet is a rare color in our temperate climate but in S. America the flowers are often fertilized by hummingbirds, in whose plumage bright red predominates. Since birds make no use of their sense of smell the flowers they visit are not fragrant. The color sense of bees is that of a color-blind person in that they do not distinguish red from green and confuse these colors with grey; the bee flowers are therefore predominately purple, violet or blue and since scent is less important to them the percentage of scented flowers in these colors is not great. The bee flowers are mostly the labiates and the thymes. Of the true blue flowers, the Egyptian waterlily, *Nymphaea stellata,* and *Primula cernua* are exceptions as both are very sweetly scented.

Some scents are perceptible only at a distance. We have noticed a fragrance as we approach the native mountain alder, *Alnus sinuata,* where the scent emanates from the opening bud scales, but close to the shrub there is no apparent smell. Poplar buds before opening scent the air with their sticky balsamic and resinous fragrance.

There is fragrance in the trees, shrubs and flowers in each month of the year, the first three months being particularly favored, with winter sweet, *Chimonanthus praecox, Hamamelis mollis,* and many daphnes, *D. Laureola, D. Mezereum, D. odora, D. Blagayana, D. Cneorum, Viburnum fragrans,* sarcococcas. *Mahonia Bealii* and *M. japonica, Skimmia* and *Osmanthus.* In the warmer months fragrant flowers are to be expected, whereas in the fall of the year the pungent herbs predominate. Again as the days become cooler *Viburnum fragrans, Hamamelis virginiana* and *Camellia Sasanqua* give forth their perfumes for us.

(Continued on Page 23)

The Arboretum Bulletin

VOL. XXV NO. 1 SEATTLE, WASH. SPRING, 1962

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9 a. m. to 4:30 p. m.
Monday through Friday
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Special Notice

To keep memberships in the Arboretum Foundation in good standing, dues should be paid during the month payable. Active memberships more than three months in arrears will be dropped and THE BULLETIN will be discontinued.

Arboretum Membership Blank

☐ Life	$500.00
☐ Sponsor	100.00 to 500.00
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University of Washington Arboretum
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I hereby apply for membership in the Arboretum Foundation and remittance for same is enclosed to cover dues for the next succeeding 12 months.

Name .....

Address .....

All memberships are non-assessable.

Our Nursery Foreman

For nearly seventeen years a most familiar figure to many Arboretum Unit members, as well as to all who work in the Arboretum, has been that of Lawrence J. Michaud, nursery foreman and chief propagator since April, 1945.

Originally hired by the late Dr. John Hanley, he has been primarily responsible during that period for the raising of thousands of young trees and shrubs from seeds, the propagation of very large numbers of others, often rare or especially selected forms from cuttings or by grafting, for the maintenance and continuity of the entire propagating department, and for final planting in the Arboretum of a large proportion of the plants thus produced.

In addition he has answered innumerable telephone inquiries for information in these fields, and conducted very many classes on plant propagation, especially for Arboretum Units and garden clubs in the Seattle area. In fact, it can safely be said that Mich, as he was familiarly known to all who worked with him, was a key member of the staff for all those years and more than filled his place in it.

Chiefly for health reasons, and following a major operation, Mich had to terminate his time with us early in December 1961, to our great regret, but he has left behind him a wonderful legacy of his work in the form of hundreds of young trees and shrubs now growing up to maturity all over the Arboretum.

We wish him, and them, the best of good fortune in the future, and look forward to seeing him again quite frequently whenever he can visit us. No one will be more welcome.

Our new nursery foreman is Kamuela (Samuel) Stevens, a native of Hawaii, graduate of the University of Wisconsin with a B. A. in Agriculture, former owner and operator of nurseries in Wisconsin and southern California, with long experience in ornamental horticulture. We feel fortunate in having obtained such a well qualified candidate for

this important position, and look forward to continued progress and close cooperation in this essential department.

B.O.M.

The Weather in 1961

The total rainfall for the year in the Arboretum was 43.38 ins., more than 10 ins. above the normal for Seattle and almost 4 ins. more than in 1960.

January, February, March and May were all considerably wetter than usual, especially February which produced exactly twice the normal fall. During the first five months the total was 26.31 ins., nearly 11 ins. above the average for that period.

On the other hand, June and September were both much drier than usual. In the former month we had measurable rain on only five days, totalling 0.51 ins., in the latter on eight days, 0.76 ins.

The amount of sunshine recorded from June through September was notable, as the following figures show.

	Hrs.	*% of possible*	*mean % (for 28 years)*
June	312.23	65	49
July	312.19	65	63
Aug.	263.11	60	56
Sept.	215.17	57	53
Total	1102.70		

For comparison, in 1960 for the same period 985.59 hours were registered in Seattle by the Weather Bureau; in 1959, 793.83 hours.

Because of this additional amount in 1961 we anticipate an excellent spring and early summer flowering of many of our trees and shrubs this year, which should be evident by the time this BULLETIN appears in print.

B.O.M.

Please, PLEASE notify the Foundation office if your address has been recently changed. The number of *Bulletins* returned due to incorrect addresses is becoming quite a problem!!!

Members of two Units have been busy in the Arboretum recently: Number 25 (Overalls) continues to packet and assemble seeds for our annual seed exchange with other similar institutions (2649 packets by March 20, 1962), while Number 20 (Heatherbells) has been transferring planting records from original loose sheets into more permanent books.

We are most grateful to all these willing and helpful workers.

Some of Our Favorites ☆ ☆ Won't You Send Us Yours?

Iris tenax

Among my favorite beardless Irises is our own *Iris tenax,* native to prairies and open hillsides in W. Washington and W. Oregon. Although it has been grown in English gardens since the days of David Douglas, it seems to be much less well known in the United States than its fellow Pacific Coast Irises, *I. Douglasiana* and *I. innominata.*

To my mind, it is at least as good a plant as those better publicized species, and for the Northwest gardener has some advantages. Because of the deciduous habit of its leaves, and the fact that its natural range extends to the vicinity of Olympia, a hundred miles or so further north than the others, it is less likely to be damaged or lost in a bad winter.

A sunny spot in a well drained location seems to satisfy its requirements. It could hardly be called a fussy plant, providing one refrains from dividing or transplanting it except in the spring when new growth is starting. Seed germinates easily, and seedlings set out in their permanent garden location can be expected to bloom by the second or third year.

The narrow leaves curve outward in a rounded tuft 8″ to 10″ across, and in late May or early June numerous slender stems appear, each bearing one or two small frilly flowers. The flower stalks appear somewhat in succession so that a large clump remains in bloom longer than the few-flowered stems

suggest. The flower form is graceful and airy; wide petals with a trace of ruffling are common and should be selected from seedling lots. (This preference for wider petals is more than a fad—they present more color to the eye, and are often of more graceful shape.)

I. tenax has one of the widest color ranges of any of the Pacific Coast species. While it cannot match the rich golden yellows of *I. innominata,* I have bloomed lovely pale yellows with deeper yellow signals, a form once regarded as a separate species, *I. Gormanii.* Among my past season's prizes were a series of seedlings with exquisitely blended peach-pink flowers, derived from these plants. Whites, orchids, and purples are the commonest colors; almost none swing nearer toward blue than a bluish lavender. Pearl grays, fawns, whites edged with pink, whites with yellow blaze, and deep purples with white blaze, are among the countless variations that have been described.

Fewer clones have been named of *Iris tenax* selections than of its better known relatives, and none of these seem to be on the market at present. While it is possible to buy plants, these are not usually selected types, and it is generally more satisfactory to collect choice plants yourself or, better yet, grow them from seeds.

JEAN WITT

Oxydendrum arboreum

A year ago last fall when driving through the Arboretum we stopped at the path that leads to the Winter Garden. Almost in front of us was a picture; a tree standing in a "pool" of beautifully colored leaves. The leaves were red, but an unusual shade, one with much yellow in the pigment, a pinkish and luminous red. The shape of the leaves was also distinctive, 4-8 inches long, grading from an egg shape at the base to a sharp point at the tip.

It was called sourwood or sorrel wood. I tasted the leaves and there was a slight sour taste but it was not unpleasant.

There was one bunch of Andromeda-like blooms left at the tip of the tree, lily-of-the-valley shaped flowers along one-sided, slender, curving stems.

Its blooming season is mid-summer when few other trees bloom. Mr. Rutherford Platt says, "Nobody notices Sorrel trees until something happens." This is when it blooms and when the leaves turn with the first frost.

Its native home is through the eastern states as far west as Indiana and south to Louisiana and Florida. Its long botanical name, *Oxydendrum arboreum,* in no way detracts from its beauty and personal charm. I found many people, of course, who knew the tree and its name but one must see it at one or other of these dramatic seasons to fully appreciate it.

I shall put it with the "must haves" in my next garden along with red maple, *Prunus subhirtella autumnalis* and one or two others if necessary. It would be a great asset, I think, when a tree is needed in a bed of rhododendrons, azaleas, or in any ericaceous family group.

GRACE T. DOWLING

Memorial Garden to David Douglas

The Royal Horticultural Society of Perthshire, Scotland, has planned and is constructing a memorial garden to David Douglas, famous plant collector of the early 19th century, in the grounds of Balhousie Castle, Perth.

The Society has sent out a list with a request for donations of plants (or seeds) which were introduced to British gardens by Douglas from the Pacific Northwest (1825-27) or from California (1831-32). As the former include many well-known native trees and shrubs (excepting, most strangely, the beautiful western dogwood, *Cornus Nuttallii)* we hope to dispatch a collection from the Arboretum this spring to Perth. A bench, or benches, of Douglas fir wood will also be placed in the garden; for this and other materials contributions of funds are invited, which may be sent to the Treasurer of the Society, Miss M. McDougall, 32 Dupplin Road, Perth, Scotland.

Garden Fragrance

(Continued from Page 19)

Francis Bacon almost suggested the close connection between scent and music; "scents and other odours are sweeter in the air at some distance, for we see that in sound likewise they are sweetest when we cannot hear every part by itself," and in his essay "Of Gardens;" . . . "and because the breathe of flowers is far sweeter in the air, where it comes and goes, like the warbling of music, than in the hand, nothing is more fit for that delight than to know the flowers and plants that do best perfume the air . . . that which yields the sweetest smell is the violet, especially the white double, which comes twice a year, next to that the musk rose, then the strawberry leaves dying with a most cordial smell; then the flower of vines, then the sweet briar, then the matted pinks and clove gilliflowers, then the flowers of lime trees, then the flowers of honeysuckles, so that they be somewhat far off. Those which perfume the air being trod upon and crushed are three, burnet, wild thyme and water-mints; therefore you are to set whole alleys of them, to have pleasure when you walk or tread."

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Calendar of Coming Events

APRIL 11 and 12—WORK AND FUN DAY(s)
Arboretum, 9:30 a.m.

MAY 17—Unit Council Meeting
Arboretum Clubhouse, 11 a.m.

JUNE 6—Arboretum Unit Chairmen and Program Chairman Meeting
Arboretum Clubhouse, 10:30 a.m.

JUNE 7—Arboretum Foundation Annual Membership Meeting
Women's University Club
Dinner, 6:30 p.m.; Meeting, 8:15 p.m.

JUNE 14, 15, 16 and 17—BONSAI EXHIBIT
Sponsored by Bonsai Arboretum Unit No. 73
Seattle Art Museum, 10 a.m. to 5 p.m. daily except Sunday, noon to 5 p.m. Thursday evening, 7 to 10 p.m. Admission 50 cents.

ARBORETUM FOUNDATION
"HOME AND GARDEN CRUISES"
Two cruises daily each Thursday in July and August, 9:30 a.m. and 1 p.m., on the *Virginia V,* embarking from 2000 Westlake North (on Lake Union). Fare, $2.50.

This is your Arboretum, kept alive by your support

We are pleased to welcome the following new members (December 15, 1961, through March 12, 1962): *Contributing*—Mrs. Harry Hartman, Shosaku Suyama. *Sustaining*—Bogachiel Garden Club, Mr. and Mrs. Richard C. Campbell, Dr. S. Fukuda, Hiroshi Gosho, Harry S. Kawabe, Magnolia Gardeners, Men's Garden Club of Seattle, Mrs. Frank J. Morrill, Mrs. Donald V. Redfern, Tobo Company, Dr. Toshikiyo Uchida, Dr. James M. Unosawa, Mrs. Arthur H. Vande Kamp, West Sammamish Garden Club. *Annual*—Mrs. Willis J. Best, Mrs. Sheldon Biback, Berne Biteman, Mr. and Mrs. Arthur J. Bratsberg, Lewis W. Brewster, Mrs. J. H. Coleman, Mrs. Jack F. Crocker, Mrs. Max D. Davis, Mrs. Earl D. Dempsey, Mrs. A. V. Delsman, Mrs. Sid W. Eland, Mrs. Harold Enquist, Mrs. M. F. Ashley Giauque, Wm. O. Griswold, Mrs. G. W. Hanthorn, Mrs. Lloyd A. Hardesty, Mrs. David O. Hardin, Mrs. Kemp E. Hiatt, Mrs. W. Ryland Hill, Mrs. Donald C. Hoyle, Ted Lidberg, Mrs. John G. Lang, Mrs. Chas. E. Lowrey, Mrs. Chas. R. Maryatt, Mrs. R. A. McDermott, Mrs. John McKenzie, Mrs. Richard L. Nelson, Mrs. Chas. E. Odegaard, Fred Y. Okada, Mrs. August Olivier, Mrs. Robert H. Olschewsky, Mrs. C. A. Pangborn, Mrs. John C. Patterson, Mrs. W. J. Pickering, Mrs. G. Forrest Sainsbury, Mrs. Saul Schluger, Mrs. John Sperry, Mrs. Alfred H. Swoffer, Mrs. William Stevens, Mrs. Kenneth D. Thorson, Mrs. J. C. Trotter, Mrs. Ralph H. Upson, Uwajimaya Co., Lewis Van Winkle, Mrs. Alvin J. Viste, Mrs. Karl S. Wahlborg, Mrs. Frank Watkins, Mrs. Jesse T. Wilkins, Jr., Mrs. Albert Williams, Mrs. Clayton Young.

We are also most grateful to the following members who have raised their dues to: *Contributing*—Mrs. Hugh Ferguson. *Sustaining*—Mrs. Joseph P. Butler, Mrs. Paul N. Carlson, Mrs. Austin G. Friend, Mrs. W. E. Henry, Mrs. Brantley Holt, Jr., Mrs. Wm. R. McMillan, Mrs. Stanley E. Stretton, Mr. and Mrs. Walter Williams.

BOOK REVIEWS

Mexican Flowering Trees and Plants, by Helen O'Gorman (Ammex Associados, Rio Amazonas, 90, Mexico City, D. F., 1961). Price $15.

IN reviewing *Mexican Trees and Plants*, by Helen O'Gorman, I hope to bring before the readers of the ARBORETUM BULLETIN some measure of the intrinsic historical, botanical and immeasurably artistic value of one of the most superbly cultural and informative books of our day. It is a masterpiece of exquisite artistry and floral allurement.

This book is the outcome of more than fifteen years of travel, study and observation by the author and covers a tremendous diversification of material.

In her introductory foreword she gives a most comprehensive background of the historical interest originally displayed by the early Spanish, French and Portuguese explorers and botanists in the Mexican countryside, and their consequent delight in the discovery and possession of many prized and rare flowering trees and plants.

It tells of their enchantment with the early gardens and other picturesque traditions—even from pre-Hispanic times—and outlines historical facts and finds of many eminent explorers and botanists as far relayed as the eras of the Aztecs, Montezuma, Cortes, Bernal Diaz del Castello, and the famous pharmacist and collector, Dr. Hernandez, who was the private physician to King Philip II of Spain.

The author, an extremely talented artist and an untiring student of botany, has illustrated her book with more than one hundred and fifty charming watercolor reproductions — for her travels have taken her over a vast and most varied geographic range.

She not only spent months in the blistering sun of the tropics and jungles, countless weeks in the cool of the mountain areas and brought treasured beauties from dark and dank murky swamplands and barrancas, but found stirring magic in the various fantastic forms of agaves, cacti and other desert growths.

Her skillful delineation of the exotic epiphytes such as orchids, epiphyllums, bromeliads and others is an outstanding example of her great talent and interest.

With every unique illustration she has accurately outlined the fundamentals underlying each association indicated, giving location where found, medicinal uses, historical background, the English, Latin, Spanish and local Mexican names of the individual specimens, and has ingeniously caught the atmosphere of her subjects in both contour and color.

Knowing Helen O'Gorman personally, I have found her to be possessed of a most dynamic personality, with a wealth of strength and individuality. She has accomplished big things in the world of art over the years and has received many awards in sculpturing and other talented performances.

Profound wonder of the beautiful must ever pervade her inner thoughts; always while perusing her interesting book, the lines from one of John Bradley's poems keep running through my mind: "The fabric of human life has been woven on delicate and earthly looms," for she has so aptly brought to life in her luminous and artfully modeled subjects not only the hidden powers of nature but has focused to our vision the magic of the unblemished blossom.

Diego Rivera, the famous Mexican artist and muralist, who was long a friend of Helen O'Gorman's, has said of her work: "The beautiful and admirable drawings, with fine color, that Helen has made of the flowers of Mexico, clean and pure, humble and strong in their great delicacy, sensitive and full of emotion and of profound tenderness, are a high tribute to the great talent of an excellent artist of Mexico, and there will be no Mexican or other who will not feel emotion from this great work."

In closing, if I could venture but one selfish wish, it would be the hope that the publishers, Ammex Associados of Mexico City, who have done such a colossal job in the production of this book and its incredibly expert floral engravings, might at some future date produce an edition more amenable in size to a traveler, one that could be carried in a brief case, for instance, for in my numerous sojourns throughout the Republic of Mexico, I have frequently come in contact with many "friends of the flowers" who have greatly deplored the fact that there was no handy and comprehensive book available that would accurately describe and identify the singularly beautiful flora of the various Mexican states. It would be a boon to tourists.

I feel confident that "Mexican Flowering Trees and Plants" not only will find its way to every authentic library's botanical shelf but will be a prized addition to many a collector's fine editions.

EDITH BANGHART

Rhododendrons of the World, by David G. Leach (Charles Scribner's Sons, New York, 1961). Price, $25.00.

AT the December meeting of the Seattle Rhododendron Society the members were invited to order this book, sight unseen, and one-third of them jumped at the opportunity. Then, when the books arrived, several people tried to buy more copies than they had ordered, for Christmas giving.

One may wonder at this eager audience. Professional competence is part of the answer but not the whole story. Mr. Leach is also a person who is seldom contented with raising a question. Instead, he likes to get the answer and report his findings with no fence-straddling.

In recent literature, he has disposed of the claims for a bud-nourishing spray preparation and has consigned *R. Furbishii* to the category of early-generation natural hybrids. Then, in the present work, he moves *R. strigillosum* from the *Maculiferum* to the *Glischrum* Subseries—a change which authorities have advocated for eleven years without taking action. This forthright approach annoys a few people but marks him as an author who has to be read.

The book is a most noteworthy production and immediately takes its place as the one broad-scale work which covers the present-day art and science of rhododendron growing.

For the purpose of review, I can perhaps best look at the portions which come within my own areas of specialty. Turning first to the section on species, the 138 pages are very satisfactory and a surprise to people who anticipated that a Pennsylvanian would take a narrow view of the genus. He starts by discussing the relationships and classification of the species, and this ranks as "must" reading. It is the first clear statement of a general theory which explains the field observations. Then he describes 148 species which are important to horticulture. This is fresh work, combining botanical accuracy with sound evaluation of garden usefulness. And the flower and leaf drawings, by Mr. Amateis, set a new standard for books aimed at a more or less general audience. Anybody can criticize his choice of the 148 species, but thereby criticizes a list which was strongly influenced by the views of Brian Mulligan, Lester Brandt and Carl English.

Another subject treated with professionalism and common sense is soils and site. Here, the only deficiency is his lack of experience with our local all-purpose mulch and soil improver—decayed Douglas fir wood.

A topic of high interest in the Seattle area is New Guinea rhododendrons, as a result of success with cuttings arriving each month from Dr. Sleumer. Mr. Leach's treatment is somewhat offhand. Even though he has visited New Guinea, it seems questionable that he encountered such amazing gems as *R. Womersleyi*, with crimson trumpets coming out of a stem which looks like club-moss.

One surprise is the omission of Lester Brandt from the otherwise excellent list of specialist nurseries.

In spite of these various demerits, the only possible advice to any enthusiast is to buy the book, even if this means going without lunch for a month.

FRANK DOLESHY

A Flower-Lover's Miscellany, by Daphne Barraclough. (Frederick Warne & Co., Ltd., London and New York, 1961.) Price, $3.95.

THE title page states that this is "an authoritative collection of factual information, together with an account of historical and legendary associations." I should like to add to these, garden romance and extra-curricular garden interests.

In the first chapter the author explains that "the most exotic of flowers in our gardens today are the descendants of the first vegetation which sprang from the earth for the service of man." Then she tells how they have traveled from country to country with Marco Polo, Captain Cook and many others, changing their manner of growth with different environments and climates, some becoming valuable as food, beautiful decorations in our gardens, or for festivities of all kinds. Even names have changed as they traveled from country to country.

There is a chapter on the part the rose has taken in English history. Besides being the English emblem on coins, stamps and all national documents, in World War II rose hips furnished the life-giving vitamin C so desperately needed by everyone. Collecting parties throughout Britain were established to gather wild rose hips.

Broom also plays its part in early history. The father of Henry II wore a sprig of broom in his helmet when he went into battle. The Plantagenet kings took their name from the Latin name of the broom. The Chinese make a tea from broom leaves.

There are quaint legends . . . "where rosemary flourishes the lady rules the house"; "to dream of roses is a portent of great good fortunes." There are various myths concerning St. John's Wort and in many places the white campanula is still known as St. Joseph's staff.

There is an amusing chapter on the use of flowers during the reign of Victoria as a lover's language. When a jonquil was presented to a lady she understood the giver meant, "I desire return of affection." The gift of a petunia expressed "your presence soothes me." A white clover meant "think of me."

The whole book has scattered bits of poetry about flowers, from Browning, Wordsworth, Herrick and others; then botanical bits about pollination and seed dispersal, "sports and rarities." There is a chapter on making pot-pourri, another on perfumes from garden flowers.

After reading the *Miscellany* I felt that I had a better and more intimate acquaintance with garden flowers than I ever had before, amusing as well as knowledgeable. It is a charming book and one I want to own.

GRACE T. DOWLING

The Rhododendron and Camellia Yearbook, 1962. (Royal Horticultural Society, London, 1961). Price $2.00, including postage.

THIS *Yearbook*, recently distributed, as usual contains a number of interesting articles on these shrubs.

The first is a description of the Gardens at Lochinch, by the late Earl of Stair. It is brief but comprehensive, particularly interesting because one of the first large-scale plantings of rhododendrons, from seed of J. D. Hooker's collecting in Sikkim in 1849, was made there.

Next is a description of Sandling Park, in which the first rhododendrons were planted some 140 years ago.

A very interesting discussion on species rhododendrons is the contribution of the late Francis Hanger, Mr. Hanger was head gardener at Exbury for many years, and worked with Mr. Lionel de Rothschild in raising and blooming many of the new species, as seeds were introduced by George Forrest, F. Kingdon-Ward, Joseph Rock and other collectors in the Orient.

The longest and most interesting article in the book is 'The Rating of Merit of Rhododendron Species," by Dr. Harold Fletcher, of the Royal Botanic Garden, Edinburgh, Scotland.

This is based on a lecture given by Dr. Fletcher at the Rhododendron Conference in Portland, May 1961. His contention, with which many gardeners who grow species rhododendrons will probably agree, is that individual plants of species, of which the series, as a whole, is given a poor rating, or perhaps none at all, should be more carefully studied.

For example, *R. Griersonianum*, which is given four stars, but many seedling plants which I have seen are not worth having, and yet others out of the same batch are very outstanding and well worth the four star rating.

Many other series should be considered in the same way, and when outstanding plants bloom, they should be given a clonal name.

An interesting article on the Temperate House at Kew Gardens, London, gives histories of some of the older plants there, and of the project of re-soiling the beds, some of which have deteriorated due to age.

Mr. Frederick Street has one of his articles on older, hardy hybrids for cold gardens, with his usual most interesting details about their history and breeding. He lists fifty of the very hardiest hybrids, and, astonishingly enough, we are still growing a number of them, some over 140 years old, in spite of all the new, beautiful hybrids that have been developed in the past few years.

Articles on the Rhododendron competition and the Rhododendron Show in England follow, with several notes on rhododendrons and camellias, particularly the effects of some late frosts in England and Scotland.

A note on some plants at Caerhays, and one on late flowering Exbury hybrids, a short list of *R. yakusimanum* hybrids, are followed by an obituary of Dr. John McQueen Cowan, one of the foremost taxonomists of rhododendrons.

A description of two new species, short articles on the shows in Tacoma and Portland (none on the Seattle show), and a further revision of camellia names follow.

There is a list of awarded rhododendrons (1961), then several pages of additions to the International Rhododendron Register.

The Rhododendron and Camellia Committee Listing for 1961 closes the book.

L. E. Brandt

The American Camellia Yearbook, 1961. Edited by Joseph H. Pyron. American Camellia Society, Tifton, Georgia. Included with yearly membership.

THE 1961 Yearbook of the American Camellia Society reflects the increased interest of a large segment of the society in serious scientific study. It is not, however, without interest to the most casual reader, collector, rank and file grower and flower arranger.

Of general interest are the series of short travel reports describing camellias growing in Japan, New Zealand, Australia, Spain. Not only are these interesting from a travel angle but they are filled with valuable bits of information; camellias growing wild in full sun in Japan give an answer to an often asked question, "How much shade must Camellias have?" Japan, which we consider the source of garden camellias, actually grows them for the valuable commercial oil derived from their seeds; surprising to find very old and extensive collections in New Zealand and Australia.

The 1961 list of new varieties shows restraint but a supplementary list of registered camellias covering 1948 to 1960 has a bewildering number of varieties indicating the overemphasis of collectors for "new".

Since the introduction several years ago of the Williamsii hybrids there has been increasing interest in hybridizing. This interest is recognized by articles in the year book.

Other articles discuss the work and aims of the Research Committee, the effect of climate, the use of growth retardants, Gibberellin and germination, all of interest to the serious grower.

A camellia rating report, lengthy and extensive, may not meet the needs of the Pacific Northwest because of our different growing conditions and weather which have a definite effect on Camellia flowers.

An article on cold hardiness should be helpful to growers in the colder sections of the Puget Sound area.

Flower arrangers are allotted their full share of space with many fine illustrations of this popular art.

Helen G. Buzard

Plant Associations of Western Washington

(Continued from Page 14)

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Western Washington Soils in Relation to Garden Ecology

(Continued from Page 11)

ally most abundant on or in the soil surface layers. In this position it is subject to the destructive forces of fire, erosion and mechanical operations.

We are securing increasing evidence that nitrogen is one of the most limiting elements for productive plant growth even under natural forest conditions. Apparently the natural forces tending to fix nitrogen from the atmosphere to the soil cannot operate at sufficient speed to supply the needs. When this natural deficiency is added to the fact that nitrogen is easily lost in its soluble inorganic forms, and the organic form is subject to rapid destruction, then it is normal to expect nitrogen shortages. This lack is quite evident in the acres of yellow lawns seen in western Washington. Procedures to conserve nitrogen present in soils or to add to the supply should be a primary concern of every gardener.

Summary

This discussion has not been a treatise on all details of soils. Selected aspects have been discussed in the hope that this will add to the interest and understanding of the gardener. An increasing number of technical books are available to the interested reader, and these should be referred to. A short reference list is included.

I feel that it is extremely important to realize soil functions as they relate to plants, namely (1) supply of water, (2) supply of essential elements, and (3) proper environment for growth and development of root systems. This last function brings into focus the proper soil structure and air supply as well as micro-organism relationships. The dynamic nature of the soil should also always be kept firmly in mind and serve to guide details of soil use.

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Comments on Plant Competition and Toleration

(Continued from Page 15)

inhibitor-producing plants included 35 different genera of grasses, trees and shrubs. All species of a genus may not have equal ability to secrete inhibitors. For example, eastern black walnut *(Juglans nigra)* elaborates a very potent inhibitor, while English walnut *(J. regia)* and the California walnuts *(J. Hindsii* and *J. californica)* produce a far less toxic form.

Most growth-inhibitors are formed in the roots but in a few cases the leaves release toxic compounds upon decomposition (e.g. desert shrubs, *Encelia farinosa,* and *Artemisia Absinthium).* In mountain ash *(Sorbus aucuparia)* the inhibitor is mainly in the fruit.

Inhibitors usually affect only one part of a plant. Plants grown near black walnut develop a characteristic wilting of the leaves, but the roots and stem are unaffected. Also, plants vary in their tolerance to inhibitors.

For example, black walnut suppresses growth of apple but not of peach, pear or plum trees, and blackberry but not raspberry, even though both berries belong to the same genus. In nature, black walnut trees have a characteristic flora around their bases comprised only of inhibitor-resistant plants.

This phenomenon may help explain mysterious incompatibilities that occur in gardening where one plant will not grow next to another. Inhibitors are known which stop the growth of seedlings of the parent species. "Fairy rings," seen in certain floral species, apparently result from seedling inhibition which permits seedlings to grow in a "ring" beyond the area of inhibition around parent plants. Certainly, lawn failures beneath trees may be inhibitor caused. Because inhibitors do not affect all species of grass in similar fashion, this condition probably could be remedied by choosing a resistant grass variety.

The ability to compete is an extremely complex biological property of plants and animals. Scientists still know very little about

the "whys," "whats" and "hows" of this phenomenon. But studies are underway to determine basic principles in the field. When fundamental laws of competition are defined, we can be certain they will add a little more "science" to the art of horticulture, and make gardening a physically easier and perhaps even more rewarding avocation.

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Arboreta and Gardens of N.W. Europe; part 5

(Continued from Page 6)

turnover in plants each year, and other details, were all of great interest to one visiting such a nursery for the first time.

A wide choice in good quality trees and shrubs is grown here, including maples, birches, beeches, quinces *(Chaenomeles),* brooms, hollies, *Philadelphus,* ten or a dozen forms of *Potentilla fruticosa,* lilacs and peonies, besides some selected forms of conifers, including dwarf types. A special catalogue is issued for American importers, and no doubt others for different countries. I am grateful to Mr. Hermann Grootendoorst for giving us so much of his valuable time that day, and was happy to see him at the International Rhododendron Conference at Portland, Oregon, in May, 1961.

Late the same afternoon we arrived at the small but densely planted nursery of L. Konijn & Co., at Reeuwijk, near Boskoop, which probably possesses the most extensive collection of conifers, both species and horticultural forms, to be found in any Dutch nursery; between 550 and 600 names are quoted in their printed list.

This should be a Mecca for anyone interested in these plants, and certainly we found it hard to tear ourselves away from examining the specimens planted near the house and then the rows of healthy young plants out in the nursery.

Here I saw grafted plants of many of the specimens seen at the Arboretum des Barres, such as *Cedrus brevifolia, Abies numidica* 'Glauca' and *A. concolor* 'Candicans,' a very handsome hybrid white pine, *Picea morrisonicola,* etc., as well as others which were found two days later in the Pinetum Blijdenstein at Hilversum—a procumbent form of our native *Abies amabilis,* and the hybrid *Pinus Schwerinii (Griffithii* x *strobus).* Quite evidently Mr. Konijn is able to obtain scions from such sources and is also a skilled propagator. It is most regrettable that the Plant Quarantine regulations of the U. S. Department of Agriculture, plus the methyl bromide fumigation which imported plants receive on arrival here, make it almost impossible to import any of these choice and rare conifers with any prospect of success.

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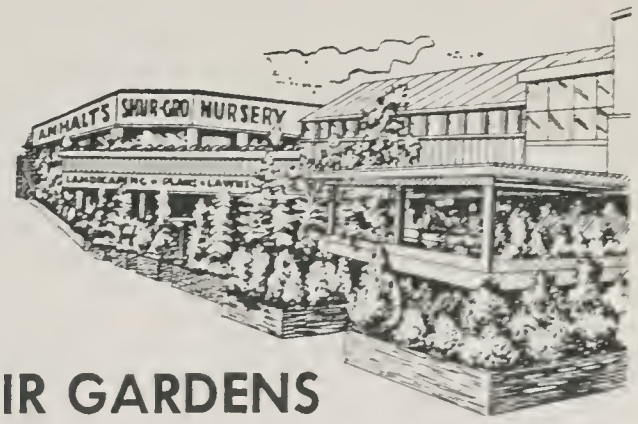

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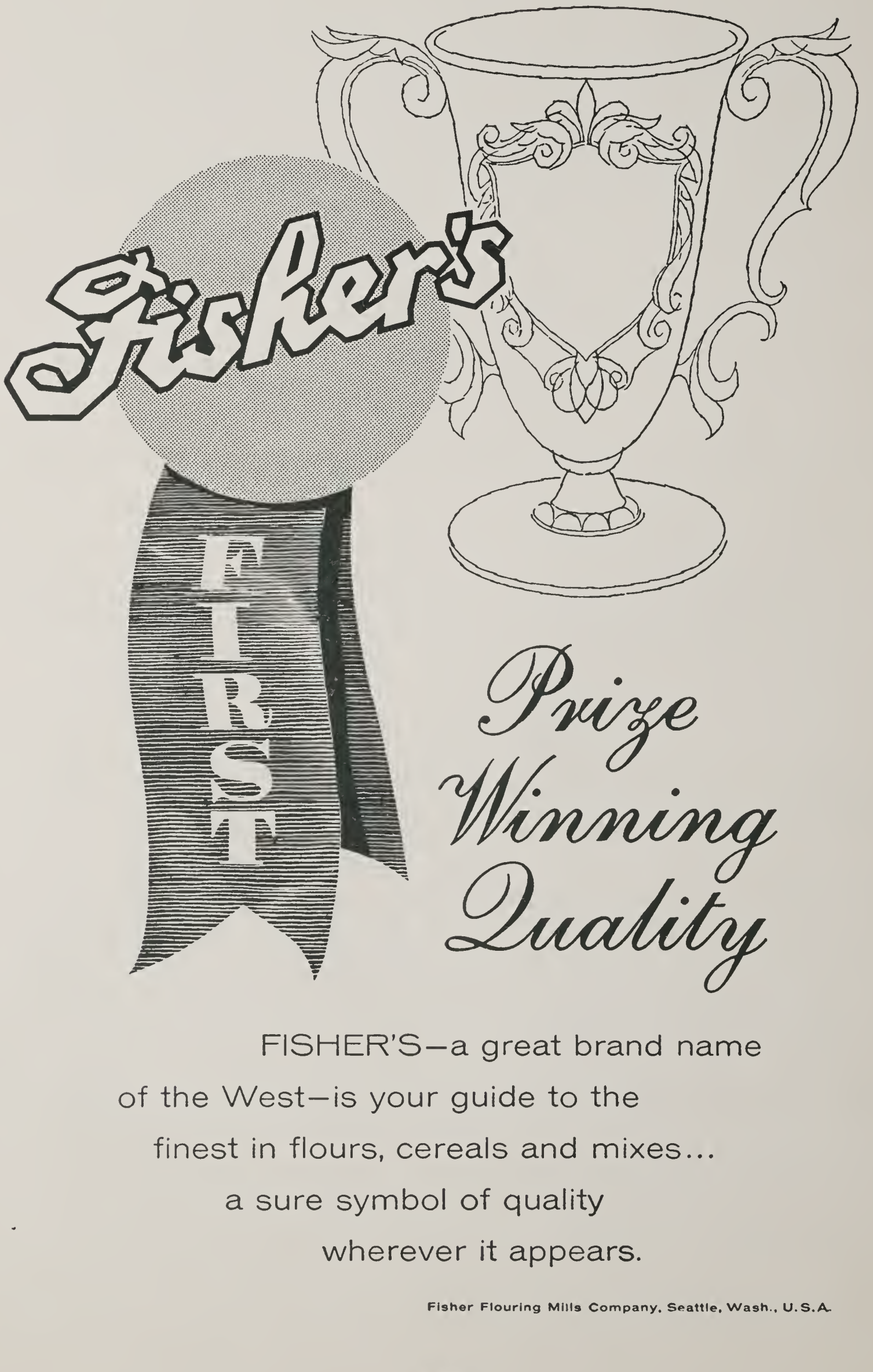

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